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A checklist of Asteraceae from Pedra do Lagarto, Santa Maria, Rio Grande do Sul, Brazil

Juliana Schaefer,[1] Liliana Essi[2]

1 Laboratório de Estudos em Vegetação Campestre, Instituto de Biociências, Universidade Federal do Rio Grande do Sul. Av. Bento Gonçalves, 9500, Prédio 43431, Agronomia, Porto Alegre, RS, Brazil. **2** Laboratório de Taxonomia Vegetal, Centro de Ciências Naturais e Exatas, Universidade Federal de Santa Maria, Avenida Roraima, 1000, prédio 16, Camobi, Santa Maria, RS, Brazil.
Corresponding author: Juliana Schaefer, julianaschaeferbio@gmail.com

Abstract
A floristic survey of the Asteraceae was carried out at the Pedra do Lagarto, Santa Maria, central region of Rio Grande do Sul state, Brazil. Field expeditions were conducted from August 2014 to September 2015. A total of 106 species were recorded, with 6 listed in the endangered species list of the state of Rio Grande do Sul: *Moquiniastrum mollissimum* (Malme) G. Sancho, *Trixis pallida* Less, *Calea clematidea* Baker, *Aldama megapotamica* (Malme) Magenta & Pirani, *Chromolaena angusticeps* (Malme) RM King & H. Rob., and *Isostigma peucedanifolium* (Spreng.) Less. This paper presents a list of recorded species from this site.

Key words
Compositae, floristic survey, endangered taxa, fragmentation, grasslands.

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Introduction

The Pedra do Lagarto is located in the Santo Antão District, a rural area of the municipality of Santa Maria, Rio Grande do Sul state, Brazil. According to Fortes (1959), this municipality is in the physiographic region of the Central Depression. The typical vegetation has a unique appearance due to a transition between the Atlantic Forest biome, which has dense forests on the slopes of Serra Geral, and the Pampa biome, which primarily includes grasslands. As cited by Marchiori (2009), predominantly herbaceous and shrubby species with cespitose patterns are characteristic in this region. The physiognomy is diverse, grouping numerous grasses, a large contingent of Asteraceae and Apiaceae, and in some places, also the dwarf Myrtaceae species (Marchiori 2009).

Grasslands are natural ecosystems that comprise a wealth of species, predominantly characterized by grasses, which form a continuous landscape and determine the physiognomy of the countryside. However, composite plants are often intermingled with these species, increasing the species richness (Boldrini et al. 2015). In addition to sheltering a large contingent of South Riograndense flora, these grasslands are also source of genetic resources (Welker and Longhi-Wagner 2007), including many endangered species. More than 500 endemic species, which are endangered due to the suppression of native grasslands, have been catalogued (Vélez-Martin et al. 2015).

Asteraceae encompasses about 24.000 species, classified into 1600–1700 genera (Funk et al. 2009) with

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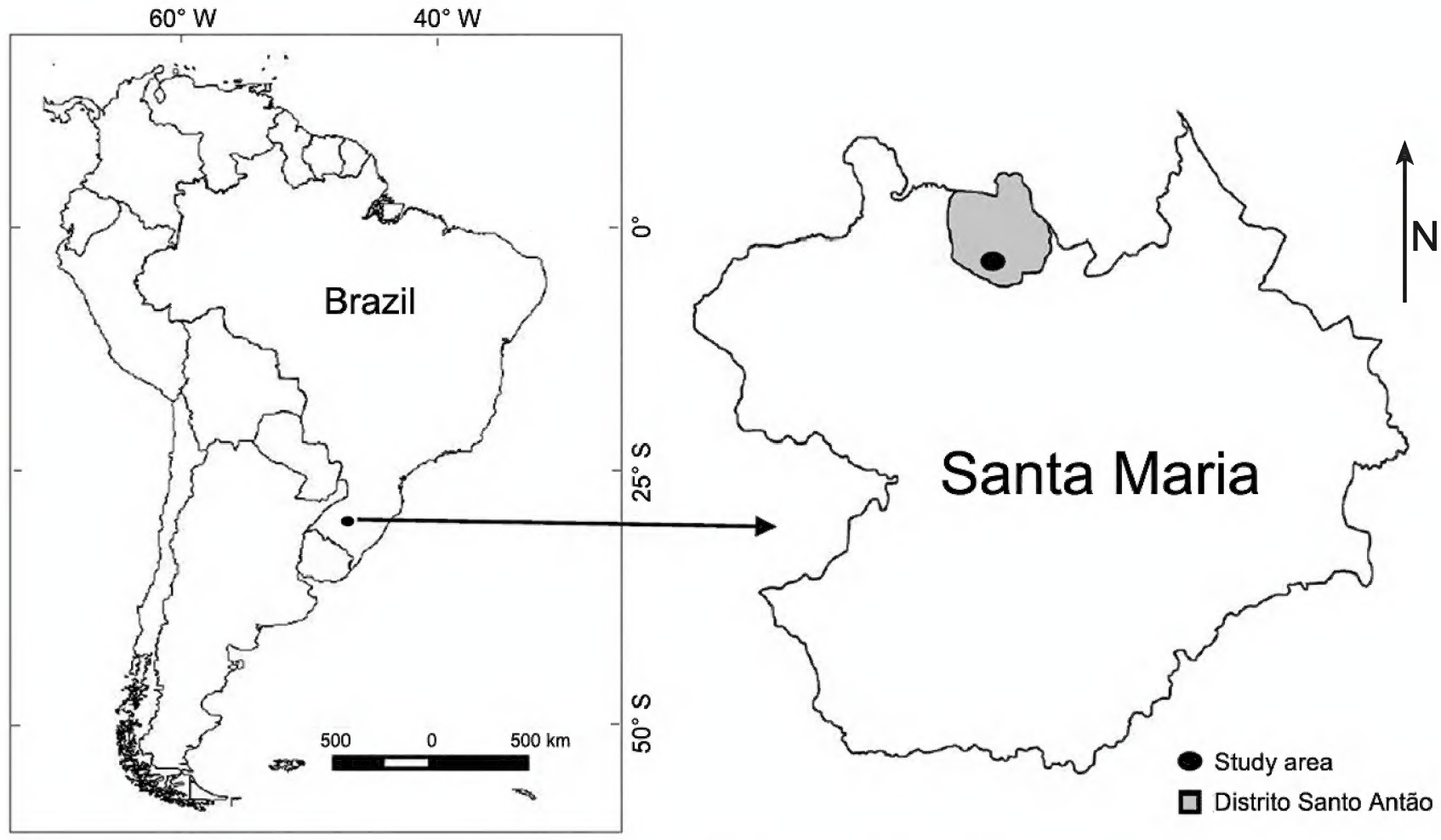

Figure 1. Map of the site of study: location in South America and Brazil, and a detail of the site of study in Santo Antão District, Santa Maria.

worldwide distribution except for Antarctica. Its species comprise about 8% to 10% of the angiosperm diversity described worldwide (Funk et al. 2009). In Rio Grande do Sul, 135 genera and 587 species have been confirmed (Flora do Brasil 2017), with 480 occurring in open areas (Boldrini et al. 2015).

Several morphological characteristics in Asteraceae support its monophyly, including the presence of highly modified heads, which include 1 or more series of involucral bracts, a bicarpelar and inferior ovarium (that develops into a cypsela), and connate anthers (Jansen and Palmer 1987). According to Cronquist (1981), the evolutionary success of this family can be attributed, in part, to the development of a chemical defense system, that includes the production of very derived secondary compounds, as well as its great dispersal capacity due to the presence of fruits with feathery pappus, appendages, and adherence structures (Venable and Leblin 1983, cited by Cancelli et al. 2006). Due to these last mentioned dispersal mechanisms, this family plays an important role in the recovery of degraded areas, with pioneer species colonizing degraded environments, such as in clearings and at forest edges (Heiden et al. 2007). Moreover, having been commonly used in folk medicine, this family has been extensively studied as a rich source of secondary metabolites that have pharmaceutical or industrial potential.

According to Nakajima and Semir (2001), Brazil is a hotspot for Asteraceae diversity, and thus, there is a need for intensive floristic surveys, especially in the grasslands, where most of composite taxa occur. Taking this into account, this study aims to survey the Asteraceae from the Pedra do Lagarto, a hill in the state of Rio Grande do Sul, Brazil. Although there are plenty of floristic surveys focusing an arboreal species (see Alberti et al. 2000, Machado and Longhi 1990, Budke et al. 2004, Longhi et al. 1999), little is known about the grassland flora in this region. In addition, this study expands the knowledge of the distribution of Asteraceae species in the state, thus contributing to conservation of especially threatened and seldom collected species.

Methods

Study site. The Pedra do Lagarto Hill is located in the District of Santo Antão, between the geographical coordinates 29°33′ S – 34°00′ S and 053°35′ – 054°08′ W, at the north of the city of Santa Maria (Fig. 1). The characteristic landscape of the area consists of hills with sandstone outcrops and forest remnants interspersed with grasslands, which is the predominant vegetation in the region (Fig. 2A, B).

The climate is mesothermal and humid, Cfa, according to the Köppen classification. It can be characterized as subtropical humid, with hot summers and without a dry season (Heldwein et al. 2009). The annual average temperature is 22 °C; however, there are large temperature fluctuations that characterize a transitional climate. The rainfall routine, according to the National Institute of Meteorology (INMET), is isoigro, i.e., normal rainfall values are well distributed throughout the year.

Floristic study. The floristic survey was carried out between August 2014 and September 2015, in 17 field expeditions, with an approximate interval of 15 days between each field trip. Samples were used a random walk method (Filgueiras et al. 1994), with changes that included additional collections over previously established lines. In addition, there were 2 extra collections on 2 adjacent hills. The specimens were collected in their reproductive stage, prepared for the herbarium according to the recommended standard methods for angiosperms, and identified with the

Figure 2. Study site "Pedra do Lagarto". **A.** View of the sandstone conglomerate of the Pedra do Lagarto. **B.** General view of the site of study and borders, showing the native grasslands, a native forest fragment and a *Pinus* plantation in the adjacent area.

aid of keys found in the literature for the family and/or through comparisons with descriptions, photographs, and illustrations. Additionally, collections in the Universidade Federal de Santa Maria (SMDB) and the Universidade Federal do Rio Grande do Sul (ICN) herbaria were examined (acronyms according to Thiers 2017). Voucher specimens were incorporated into the SMDB herbarium. This study follows the classification of tribes presented by Funk et al. (2009), but the species-level nomenclature was updated based on the *Flora do Brasil 2020* database (Flora do Brasil 2017), except for the circumscription of some species of *Eupatorium* L. and *Senecio* L., which were based on Maztenbacher (1979) and (1998) respectively. Quantum GIS v. 2.14 (using WGS84 datum) and Photoshop v. CS6 were used for the preparation of the figures (map and images).

Results

A total of 106 species were recorded. These are distributed in 51 genera and 17 tribes (Table 1). The most diverse tribe was Eupatorieae (23 species), followed by Astereae (20), Vernonieae (12), Gnaphalieae (9), Inuleae (9), Heliantheae (6), Senecioneae (5), Mutiseae (4), Nassauvieae (3), Cichorioideae (3), Coreopsideae (2), Tageteae (2), and Gochnatieae (2). The tribes, Millerieae, Neurolaenaeae, Anthemideae, and Barnadesieae were represented by a single species each.

Discussion

The species of Asteraceae recorded in this study site are mostly typical of the grasslands of the Central Depression, such as *Baccharis articulata* (Fig. 3C), *Vernonanthura nudiflora, Senecio brasiliensis*, and *Aspilia montevidensis* (Fig. 7B). Nonetheless, due to, the gradient of habitats, such as wetlands, forest remnants, dry grasslands, and rocky outcrops, a great floristic diversity was found.

Species such as *Baccharis megapotamica*, *Pluchea sagittalis*, *Jaegeria hirta*, *Jungia floribunda*, and *Heterocondylus decipiens* have preference for humid environments or wetlands. On the other hand, *Dasyphyllum brasiliense*, *Kaunia rufescens* (Fig. 6A), *Mutisia campanulata* (Fig. 8C), and the species of *Mikania* (*M. cordifolia* and *M. micrantha*) are characteristic of the borders along forest remnants. Most the taxa are recorded from drier fields or rocky outcrops, such as *Baccharis articulata*, *B. cultrata. B. linearifolia* (Fig. 3B), *Pterocaulon polypterum*, *P. rugosum*, *Aldama nudicaulis*, and *Baccharis riograndensis.*

We recorded 6 threatened species, *Moquiniastrum mollissimum* (Fig. 6E, F), *Chromolaena angusticeps, Calea clematidea* (Fig. 9A), *Aldama megapotamica, Isostigma peucedanifolium* (Fig. 5C–F), and *Trixis pallida* (Fig. 8E–F), as well as a species that is rare in the state, *Heterocondylus decipiens*. In addition, a taxon not previously recorded from the municipality, *Achyrocline anabelae*, was also collected.

Asteraceae is the family with the highest diversity in Rio Grande do Sul (Boldrini et al. 2015), with 89 species considered endangered, according to the state list (SEMA 2014). As found in this study, the Asteraceae mainly inhabit grasslands, which according to Overbeck et al. (2007), suffers continuous pressure from human activities such as agriculture and forestry.

Moquiniastrum mollissimum is a species endemic to the central-eastern region of Rio Grande do Sul and was considered "probably extinct" until 2009, when it was found on the side of a granite hill in Viamão (Mondin 2009). In contrast, in the municipality of Santa Maria, the last known record of this species was about 60 years ago. This species was found in grasslands with sandstone outcrops, forming a large population. The place itself supports many plants, including rare or endangered species of other families, such as *Mandevilla coccinea* (Hook & Arn.) Woodson (Apocynaceae), *Hesperozygis ringens* (Benth.) Epling (Lamiaceae), *Echinopsis oxygona* (Link & Otto) Pfeiffer. & Otto (Cactaceae), *Parodia ottonis* (Lehm.) P. N. Taylor (Cactaceae), *Parodia linkii* (Lehm.) R. Kiesling (Cactaceae), and *Dyckia ibicuiensis* Strehm (Bromeliaceae).

Calea clematidea was recorded not only from "Pedra do Lagarto", but also in the adjacent hills, exhibiting

Table 1. List of the species identified at the study site, ordered by tribe. Vouchers, habit and habitat are presented for each species. The habit was described according to observations in the study site, eventually completed with information from the literature (in this case, a reference is cited).

Species	Vouchers	Habit	Habitat	Latitude (S)	Longitude (W)
Tribe Anthemideae					
Soliva sessilis Ruiz & Pav. (Fig. 3A)	Schaefer, J. (514) (SMDB 15791)	Herb	Disturbed grasslands.	29°37′47.79″	053°52′22.35″
Tribe Astereae					
Baccharis anomala DC.	Schaefer, J. (386) (SMDB 15751)	Scandent shrub	Edge of forest thickets and glades (Barroso and Bueno 2002), common along roadsides.	29°37′47.53″	053°52′21.21″
Baccharis articulata (Lam.) Pers. (Fig. 3C)	Schaefer, J. (59) (SMDB 16039)	Shrub	Prefers dry and rocky terrain (Heiden et al. 2009).	29°37′38.26″	053°52′23.46″
Baccharis crispa Spreng.	Schaefer, J. (250) (SMDB 15889)	Sub-shrub	Dry or wet fields, in rocky outcrops, forest borders or disturbed areas.	29°37′39.91″	053°52′23.18″
Baccharis cultrata Baker.	Schaefer, J. (508) (SMDB 15798)	Shrub	Grasslands with rocky outcrops.	29°37′38.78″	053°52′23.40″
Baccharis dracunculifolia DC.	Schaefer, J. (278) (SMDB 15993)	Shrub	Anthropic areas such as barns, forest borders and pathways (Barroso and Bueno 2002).	29°37′33.09″	053°52′26.83″
Baccharis linearifolia (Lam.) Pers. (Fig. 3B)	Schaefer, J. (329) (SMDB 15748)	Shrub	In fields with rocky outcrops (Fernandes and Ritter 2009).	29°37′37.67″	053°52′24.80″
Baccharis megapotamica Spreng.	Schaefer, J. (291) (SMDB 15806)	Shrub	Humid grasslands and wetlands.	29°37′44.04″	053°52′22.00″
Baccharis punctulata DC.	Schaefer, J. (385) (SMDB 15788)	Shrub	Open places and anthropic areas, such as croplands.	29°37′31.32″	053°52′26.27″
Baccharis riograndensis Malag & J. E. Vidal.	Schaefer, J. (406) (SMDB 15888)	Sub-shrub	Grasslands with rocky outcrops.	29°37′37.24″	053°52′26.52″
Baccharis spicata (Lam.) Baill.	Schaefer, J. (469) (SMDB 15758)	Shrub	Secondary vegetation, in anthropic areas, such as abandoned crops.	29°37′30.01″	053°52′25.84″
Baccharis vulneraria Baker.	Schaefer, J. (302) (SMDB 15787)	Shrub	In clumps, associated with shallow soils (Barroso and Bueno 2002).	29°37′44.48″	053°52′20.41″
Conyza blakei (Cabrera.) Cabrera	Schaefer, J. (381) (SMDB 15786)	Herb	In grasslands and forest edges (Fernandes and Ritter 2009).	29°37′42.12″	053°52′29.46″
Conyza bonariensis (L.) Cronquist	Schaefer, J. s/n. (SMDB 15858)	Herb	Modified places, dry or damp grasslands.	29°37′42.72″	053°52′29.16″
Conyza sumatrensis (Retz.) E. Walker (Fig. 4A)	Schaefer, J. (397) (SMDB 15857)	Herb	Dry grasslands and disturbed areas.	29°37′41.12″	053°52′29.73″
Conyza primulifolia (Lam.) Cuatrec. & Lorrteig.	Schaefer, J. (465) (SMDB 15780)	Herb	Grasslands or disturbed areas.	29°37′42.53″	053°52′29.90″
Noticastrum calvatum (Baker.) Cuatrec.	Schaefer, J. (548) (SMDB 15823)	Herb	Dry grasslands.	29°37′43.97″	053°52′29.22″
Noticastrum diffusum (Pers.) Cabrera	Schaefer J. s/n. (SMDB 15817)	Herb	Dry grasslands.	29°37′47.52″	053°52′31.01″
Noticastrum gnaphalioides (Baker) Cuatrec	Schaefer, J. (211) (SMDB 15890)	Herb	Dry grasslands or with rocky outcrops.	29°37′47.52″	053°52′31.01″
Solidago chilensis Meyen	Schaefer, J. (384) (SMDB 15999)	Herb	Dry grasslands, close to dwellings.	29°37′46.60″	053°52′21.30″
Tribe Barnadesieae					
Dasyphyllum brasiliense (Spreng.) Cabrera	Schaefer, J. (501) (SMDB 15969)	Tree or climbing shrub	Forest.	29°37′42.16″	053°52′23.17″
Tribe Cichorieae					
Hieracium comersonii Monnier (Fig. 4B, C)	Schaefer, J. (510) (SMDB 15790)	Herb	Grasslands with rocky outcrops.	29°37′39.59″	053°52′26.07″
Hypochaeris chillensis (Kunth.) Britton. (Fig. 4D)	Schaefer, J. (537) (SMDB 15819)	Herb	Herbaceous or shrubby grasslands (Azevêdo-Gonçalves and Matzenbacher 2007).	29°37′39.14″	053°52′27.47″
Hypochaeris megapotamica Cabrera (Fig. 4E)	Schaefer, J. (152) (SMDB 15851)	Herb	Herbaceous or shrubby grasslands and in rocky soils (Azevêdo-Gonçalves and Matzenbacher 2007).	29°37′43.07″	053°52′29.82″
Tribe Coreopsideae					
Bidens pilosa L. (Fig. 5A, B)	Schaefer, J. (467) (SMDB 15730)	Herb	Areas modified by agriculture, abandoned areas.	29°37′46.02″	053°52′20.92″
*Isostigma peucedanifolium (*Spreng.) Less. (Fig. 5C–F)	Schaefer, J. (209) (SMDB 15733)	Herb	Inhabits dry soils in grassland vegetation (Mondin 2004).	29°37′47.79″	053°52′06.58″

Table 1. *Continued.*

Species	Vouchers	Habit	Habitat	Latitude (S)	Longitude (W)
Tribe Eupatorieae					
Ageratum conyzoides L.	Schaefer, J (67) (SMDB 15873)	Herb	Disturbed areas like roadsides and crops.	29°37′47.03″	053°52′21.15″
Austroeupatorium inulaefolium (Kunth) R.M. King & H. Rob.	Schaefer, J. (430) (SMDB 15773)	Shrub	Grasslands, forest edges, or anthropogenic environments.	29°37′46.95″	053°52′28.93″
Austroeupatorium laetevirens (Hook. & Arn.) R. M. King & H. Rob	Schaefer, J. (481) (SMDB 15946)	Sub-shrub	Grasslands with rocky outcrop.	29°37′38.47″	053°52′24.25″
Campuloclinium macrocephalum (Less.) DC.	Schaefer, J. (298) (SMDB 15945)	Herb	Grasslands with wet soils and modified locations.	29°37′43.19″	053°52′22.69″
Chromolaena angusticeps (Malme) R. M. King & H. Rob.	Schaefer, J. (313) (SMDB 15760)	Sub-shrub	Grasslands with rocky outcrop.	29°37′38.48″	053°52′27.55″
Chromolaena congesta (Hook. & Arn.) R. M. King & H. Rob.	Schaefer, J. (418) (SMDB 15927)	Sub-shrub	Grasslands with rocky outcrop, both in shallow and lithic soils, plus wet soils.	29°37′38.08″	053°52′25.33″
Chromolaena hirsuta (Hook. & Arn.) R.M. King & H. Rob.	Schaefer, J. (440) (SMDB 15776)	Sub-shrub	Along forest borders, grasslands with rocky outcrops and in modified locations (Beretta et al. 2008).	29°37′37.52″	053°52′27.85″
Chromolaena laevigata (Lam.) R.M. King & H. Rob.	Schaefer, J. (433) (SMDB 15756)	Sub-shrub	Grasslands with rocky outcrops, moist soils and forest borders.	29°37′43.63″	053°52′21.36″
Chromolaena pedunculosa (Hook. & Arn.) R. M. King & H. Rob.	Schaefer, J. s/n (SMDB 15784)	Sub-shrub	Forest borders, inside disturbed habitats such as roadsides, abandoned barns and grasslands.	29°37′39.20″	053°52′28.00″
Chromolaena squarrulosa (Hook. & Arn.) R.M. King & H. Rob.	Schaefer, J. (228) (SMDB 15974)	Sub-shrub	Grasslands.	29°37′38.18″	053°52′24.93″
Chromolaena verbenacea (Dc.) R. M. King & H. Rob	Schaefer, J. s/n (ICN 194330)	Sub-shrub	Grasslands.	29°37′39.20″	053°52′28.00″
Disynaphia ligulifolia (Hook. & Arn.) R.M. King & H. Rob.	Schaefer, J. (448) (SMDB 15785)	Shrub	Grasslands with rocky outcrops.	29°37′52.99″	053°52′32.84″
Disynaphia multicrenulata (Sch. Bip. ex Baker.) R. M. King & H. Rob.	Schaefer, J. (342) (SMDB 15777)	Shrub	Species found in grasslands located in moist soils and swamps, in the middle of high herbaceous vegetation, and in shrubby grasslands (Cabrera and Klein 1989).	29°37′39.30″	053°52′26.55″
Gyptis tanacetifolia (Gillies ex Hook. & Arn.) D.J.N. Hind & Flann (Fig. 6B)	Schaefer, J. (168) (SMDB 15775)	Herb	Grasslands with rocky outcrops or wet soils.	29°37′39.30″	053°52′26.55″
Gyptis lanigera (Hook. & Arn.) R.M. King & H. Rob.	Schaefer, J. (410) (SMDB 15774)	Herb	Grasslands with rocky outcrops.	29°37′38.02″	053°52′24.55″
Hatschbachiella tweedieana (Hook. & Arn.) R.M. King & H. Rob.	Schaefer, J. (379) (SMDB 15947)	Sub-shrub	Grasslands with litholic soils, wet, or in anthropic places.	29°37′38.17″	053°52′26.29″
Heterocondylus decipiens (Baker.) R. M. King. & H. Rob.	Schaefer, J. (494) (SMDB 15939)	Herb	Prefers grasslands located in wet or marshy soils (Cabrera and Klein 1989).	29°37′43.54″	053°52′22.49″
Kaunia rufescens (Lund ex DC.) R.M. King & H. Rob. (Fig. 6A)	Schaefer, J. (68) (SMDB 15972)	Shrub or sub-tree	Forest borders.	29°37′46.30″	053°52′29.15″
Mikania cordifolia (L.f.) Willd.	Schaefer, J. (400) (SMDB 15891)	Herbaceous climber	Forest borders.	29°37′46.33″	053°52′29.58″
Mikania fulva (Hook. & Arn.) Baker	Schaefer, J. (457) (SMDB 15936)	Sub-shrub	Grasslands and roadsides.	29°37′51.21″	053°52′32.82″
Mikania micrantha Kunth.	Schaefer, J. (432) (SMDB 15882)	Herbaceous climber	Forest borders.	29°37′46.34″	053°52′29.60″
Praxelis clematidea (Griseb.) R. M. King & H. Rob.	Schaefer, J. (542) (SMDB 15827)	Herb	Grasslands with rocky outcrops and disturbed places.	29°37′38.08″	053°52′27.01″
Stevia tenuis Hook. & Arn.	Schaefer, J. (542) (SMDB 16346)	Herb	Grasslands with rocky outcrops.	29°37′38.83″	053°52′28.26″
Symphyopappus cuneatus (DC.) Sch. Bip. ex Baker (Fig. 6C)	Schaefer, J. (142) (SMDB 15847)	Shrub	Grasslands with rocky outcrops.	29°37′39.18″	053°52′27.77″
Tribe Gnaphalieae					
Achyrocline alata (Kunth) DC.	Schaefer, J. (382a) (SMDB 15975)	Herb	Wet grasslands.	29°37′44.03″	053°52′21.60″
Achyrocline anabelae Deble	Schaefer, J. (344) (SMDB 16023)	Herb	On the top of the hill, close to forest relict.	29°37′38.83″	053°52′26.55″
Chevreulia sarmentosa (Pers.) Blake.	Schaefer, J. (515) (SMDB 16036)	Herb	Dry grasslands.	29°37′43.89″	053°52′29.80″
Facelis retusa (Lam.) Sch. Bip. (Fig. 6D)	Schaefer, J. (517) (SMDB 15794)	Herb	Dry grasslands and disturbed places.	29°37′43.10″	053°52′28.92″

Table 1. *Continued.*

Species	Vouchers	Habit	Habitat	Latitude (S)	Longitude (W)
Gamochaeta americana (Mill.) Wedd	Schaefer, J. (163) (SMDB 15884)	Herb	Dry grasslands and disturbed places.	29°37′43.02″	053°52′29.39″
Gamochaeta pensylvanica (Willd.) Cabrera	Schaefer, J. (519) (SMDB 15794)	Herb	Dry or wet grasslands, with rocky outcrops, and in disturbed areas too.	29°37′43.38″	053°52′27.61″
Gamochaeta simplicicaulis (Willd. ex. Spreng.) Cabrera	Schaefer, J. (347) (SMDB 15782)	Herb	Grasslands and forest borders.	29°37′42.72″	053°52′27.75″
Lucilia acutifolia (Poir.) Cass.	Schaefer, J. (197) (SMDB 15991)	Herb	Grasslands.	29°37′43.36″	053°52′22.23″
Lucilia nitens Less.	Schaefer, J. (187) (SMDB 15992)	Herb	Grasslands with rocky outcrops.	29°37′48.08″	053°52′07.33″
Tribe Gochnatieae					
Moquiniastrum mollissimum (Malme) G. Sancho. (Fig. E, F)	Schaefer, J. (332) (SMDB 15796)	Shrub	Grasslands with sandstone or granite rocky outcrops.	29°37′40.47″	053°52′22.64″
Moquiniastrum polymorphum (Less.) G. Sancho	Schaefer, J. (321a) (SMDB 15921)	Tree	Dry or wet grasslands and forest borders.	29°37′43.00″	053°52′23.13″
Tribe Heliantheae					
Acmella bellidioides (Sm.) R. K. Jansen (Fig. 7A)	Schaefer, J. (138) (SMDB 15747)	Herb	In grasslands with dry, wet, loamy, sandy or stony soils (Mondin 2004).	29°37′43.35″	053°52′22.69″
Aldama anchusifolia (DC.) E. E. Schill. & Panero. (Fig. 7C–E)	Schaefer, J. (312) (SMDB 15977)	Sub-shrub	Dry soils in grassland, among rocky outcrops.	29°37′38.01″	053°52′25.83″
Aldama megapotamica (Malme) Magenta & Pirani	Schaefer, J. (456) (SMDB 15849)	Sub-shrub	Grasslands with dry soils (Mondin 2004).	29°37′51.40″	053°52′31.95″
Aldama nudicaulis (Baker) E. E. Schill. & Panero	Schaefer, J. (538) (SMDB 15892)	Sub-shrub	Grasslands in dry soils (Mondin 2004).	29°37′52.81″	053°52′33.40″
Aspilia montevidensis (Spreng.) Kuntze (Fig. 7B)	Schaefer, J. (237) (SMDB 15728)	Herb	Common in grasslands, with ruderal behavior in disturbed areas.	29°37′38.85″	053°52′24.04″
Verbesina sordescens DC.	Schaefer, J. (412) (SMDB 15745)	Sub-shrub	Dry soils in grasslands, rocky environments, ruderal along roadsides (Mondin 2004).	29°37′28.55″	053°52′25.66″
Tribe Inuleae					
Pluchea sagittalis (Lam.) Cabrera	Schaefer, J. (283) (SMDB 15918)	Herb or sub-shrub	Prefers moist grasslands, wetlands and can grow in sandy areas (Dalpiaz and Ritter 1998).	29°37′44.40″	053°52′20.82″
Pterocaulon alopecuroides (Lam.) DC.	Schaefer, J. (395a) (SMDB 15934)	Sub-shrub	Shrub-lands.	29°37′37.09″	053°52′25.15″
Pterocaulon angustifolium DC.	Schaefer, J. (280a) (SMDB 15933)	Sub-shrub	Grasslands, stony grasslands and hilltops.	29°37′38.83″	053°52′23.09″
Pterocaulon polypterum (DC.) Cabrera.	Schaefer, J. (251) (SMDB 15752)	Sub-shrub	Often associated with rocky soils, usually found on slopes and tops of granite hills (Lima and Matzenbacher 2008), but collected on a hillside with sandstone formations (this study).	29°37′38.74″	053°52′22.05″
Pterocaulon polystachyum DC.	Schaefer, J. (317) (SMDB 15932)	Sub-shrub	Species inhabiting different environments from roadsides and waterways, dirty grasslands and forest borders (Lima and Matzenbacher 2008).	29°37′37.14″	053°52′21.48″
Pterocaulon rugosum (Vahl.) Malme	Schaefer, J. (442) (SMDB 15925)	Sub-shrub	Rocky grasslands.	29°37′38.08″	053°52′24.56″
Stenachaenium campestre Baker.	Schaefer, J. (214) (SMDB 15797)	Herb	Along roadside grasslands with rocky outcrops, dry grasslands with low grasses and with "vassoural" (extensive cluster of 'bushes', usually *Baccharis* species) (Marodin and Ritter 1997).	29°37′48.21″	053°52′07.69″
Stenachaenium megapotamicum (Spreng.) Baker	Schaefer, J. (333) (SMDB 16021)	Herb	Dry grasslands, wet or rocky outcrops.	29°37′31.03″	053°52′25.56″
Stenachaenium riedelli Baker (Fig. 8A)	Schaefer, J. (166) (SMDB 15732)	Herb	Grassland with rocky outcrops and dry grasslands with "vassoural".	29°37′46.67″	053°52′23.45″
Tribe Milerieae					
Jaegeria hirta (Lag.) Less	Schaefer, J. (392b) (SMDB 15983)	Herb	Prefers humid and semi-shaded areas, inside and along the border of the forests (Mondin 2004).	29°37′44.05″	053°52′20.39″
Tribe Mutisieae					
Chaptalia integerrima (Vell.) Burkart	Schaefer, J. (287) (SMDB 15727)	Herb	In formations with human influence, also inhabiting dry and wet soils (Pasini et al. 2014).	29°37′39.41″	053°52′23.84″
Chaptalia nutans (L.) Polack (Fig. 8B)	Schaefer, J. (70) (SMDB 15815)	Herb	Dry or rocky soils of grassland, interior and borders of forests (Pasini et al. 2014).	29°37′41.83″	053°52′23.29″
Chaptalia runcinata Kunth.	Schaefer, J. (464) (SMDB 15792)	Herb	Open grasslands or forest borders.	29°37′40.40″	053°52′23.31″

Table 1. *Continued.*

Species	Vouchers	Habit	Habitat	Latitude (S)	Longitude (W)
Mutisia campanulata Less. (Fig. 8C)	Schaefer, J. (500) (SMDB 15986)	Climbing shrub	Forest borders, along capon coops and clearings in the woods (Cabrera and Klein 1973).	29°37'40.40"	053°52'29.61"
Tribe Nassauvieae					
Jungia floribunda Less.	Schaefer, J. (293) (SMDB 15772)	Herb	Wetlands.	29°37'43.78"	053°52'20.13"
Trixis pallida Less. (Fig. 8E, F)	Schaefer, J. (226) (SMDB 15978)	Herb	Dry grasslands.	29°37'49.26"	053°52'06.55"
Trixis nobilis (Vell.) Katinas (Fig. 8D)	Schaefer, J. (259) (SMDB 15755)	Herb	Hill top with sandstone outcrops and along the roadside.	29°37'39.58"	053°52'26.53"
Tribe Neurolaeneae					
Calea clematidea Baker (Fig. 9A)	Schaefer, J. (216) (SMDB 15980)	Sub-shrub	Open places, dry and rocky soils of slopes (Mondin 2004).	29°37'38.38"	053°52'25.20"
Tribe Senecioneae					
Erechtites hieraciifolius (L.) Raf. ex DC.	Schaefer, J. (345) (SMDB 15929)	Herb	Dry and wet grasslands.	29°37'39.38"	053°52'22.87"
Erechtites valerianifolius (Wolf) DC.	Schaefer, J. (475) (SMDB 15928)	Herb	Dry grasslands and forest borders, however one of the collections of the present study was found in a wetland.	29°37'44.87"	053°52'22.71"
Senecio brasiliensis (Spreng.) Less	Schaefer, J. (131) (SMDB 15754)	Herb or sub-shrub	Shrubby grasslands with stony, clay and humiferous soils (Matezenbacher 1998).	29°37'40.04"	053°52'23.47"
Senecio leptolobus DC. (Fig. 9B)	Schaefer, J. (154) (SMDB 15998)	Sub-shrub	Sandy-clayey grasslands, granitic and basaltic soils (Matzenbacher 1998).	29°37'39.15"	053°52'23.11"
Senecio oxyphyllus Baker.	Schaefer, J. (134) (SMDB 15964)	Sub-shrub	Wet or dry grasslands (Matzenbacher 1998).	29°37'44.22"	053°52'22.16"
Tribe Tageteae					
Porophyllum ruderale (Jacq.) Cass.	Schaefer, J. (311) (SMDB 15813)	Herb	Forest borders, but primarily in disturbed places.	29°37'39.14"	053°52'27.60"
Tagetes minuta L	Schaefer, J. (506) (SMDB 15779)	Herb	Disturbed places.	29°37'48.39"	053°52'20.85"
Tribe Vernonieae					
Chrysolaena cognata (Less.) Dematt.	Schaefer, J. (330) (SMDB 15837)	Herb or shrub	Wet or dry grasslands.	29°37'39.45"	053°52'26.25"
Chrysolaena flexuosa (Sims) H. Rob.	Schaefer, J. (189) (SMDB 15838)	Herb	Grasslands with rocky outcrops and sandy soils.	29°37'51.24"	053°52'32.60"
Chrysolaena lithospermifolia (Hieron.) H. Rob.	Schaefer, J. (401) (SMDB 16035)	Herb	Grasslands with rocky outcrops and sandy soils.	29°37'51.57"	053°52'32.67"
Elephantopus mollis Kunth. (Fig. 9C, E)	Schaefer, J. (230a) (SMDB 15871)	Herb	Very often develops as weed or ruderal plant, especially in environments where the soil was plowed inside a forest, wastelands and near housing.	29°37'41.79"	053°52'23.04"
Lessingianthus brevifolius (Less.) H. Rob.	Schaefer, J. (175) (SMDB 15982)	Herb	Grasslands with rocky outcrops.	29°37'52.79"	053°52'33.06"
Lessingianthus hypochaeris (DC.) H. Rob. (Fig. 9D)	Schaefer, J. (453) (SMDB 15835)	Herb	Grasslands with rocky outcrops and "vassoural".	29°37'51.83"	053°52'33.15"
Lessingianthus sellowii (Less.) H. Rob.	Schaefer, J. (306) (SMDB 15937)	Herb	Wet and rocky grasslands.	29°37'39.87"	053°52'27.06"
Orthopappus angustifolius (Sw.) Gleason	Schaefer, J. (439) (SMDB 15846)	Herb	Dry grasslands with rocky outcrops and altered areas.	29°37'36.58"	053°52'24.13"
Stenocephalum megapotamicum (Spreng.) Sch. Bip	Schaefer, J. (280) (SMDB 15985)	Herb	Dry or wet grasslands, with rocky outcrops.	29°37'37.08"	053°52'22.78"
Vernonanthura montevidensis (Spreng.) H. Rob	Schaefer, J and Essi, L. (Li676) (SMDB 15920)	Shrub	Grasslands with rocky outcrops.	29°37'38.46"	053°52'26.85"
Vernonanthura nudiflora (Less.) H. Rob.	Schaefer, J. (316) (SMDB 15922)	Herb	Grasslands with shallow dry soils (Cabrera and Klein, 1980).	29°37'36.19"	053°52'21.99"
Vernonanthura tweediana (Baker) H. Rob.	Schaefer, J. (387) (SMDB 15919)	Shrub	Abundant in wet grassland or recently abandoned.	29°37'44.27"	053°52'22.34"

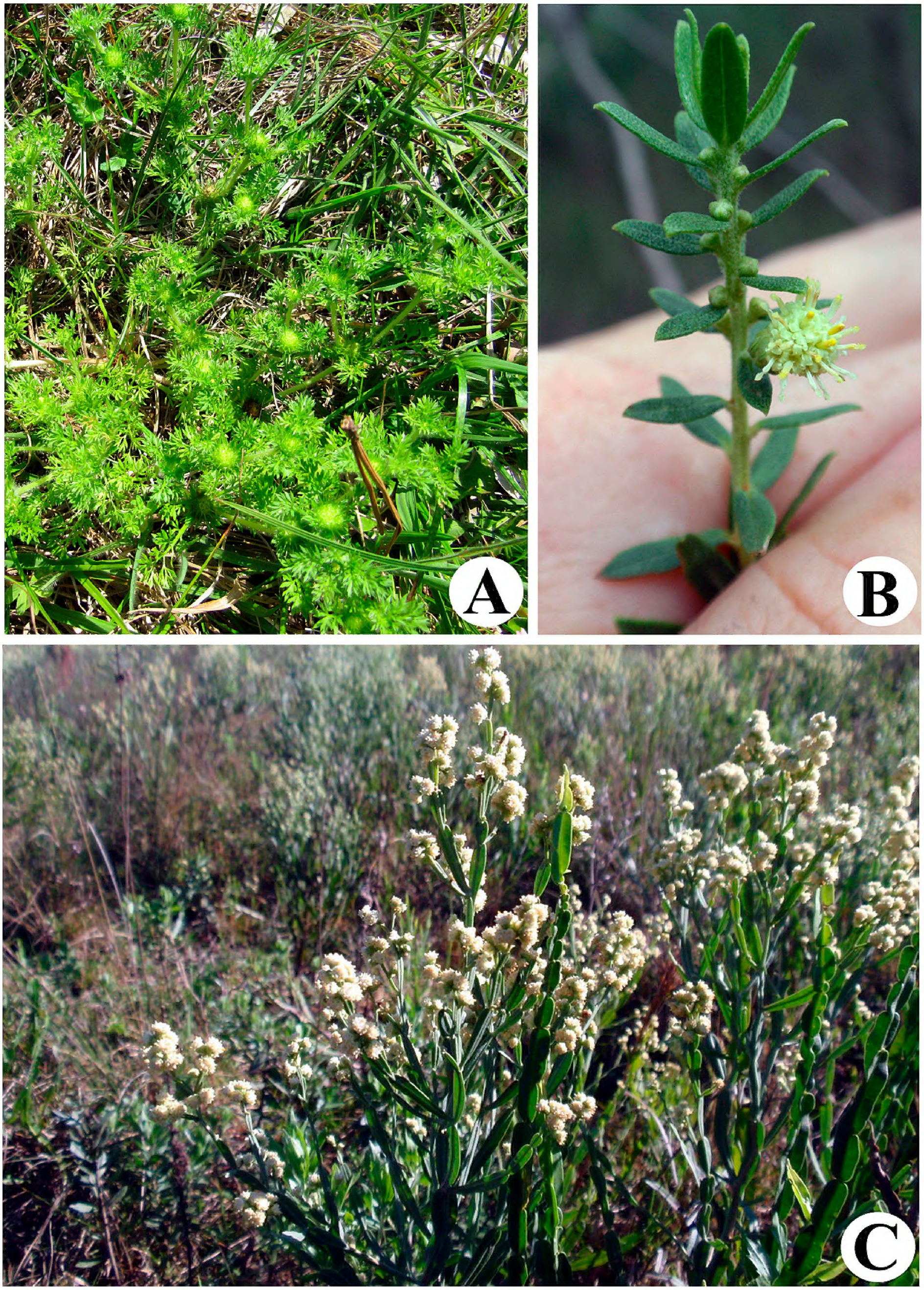

Figure 3. A. *Soliva sessilis*. **B.** *Baccharis linearifolia*. **C.** *Baccharis articulata*.

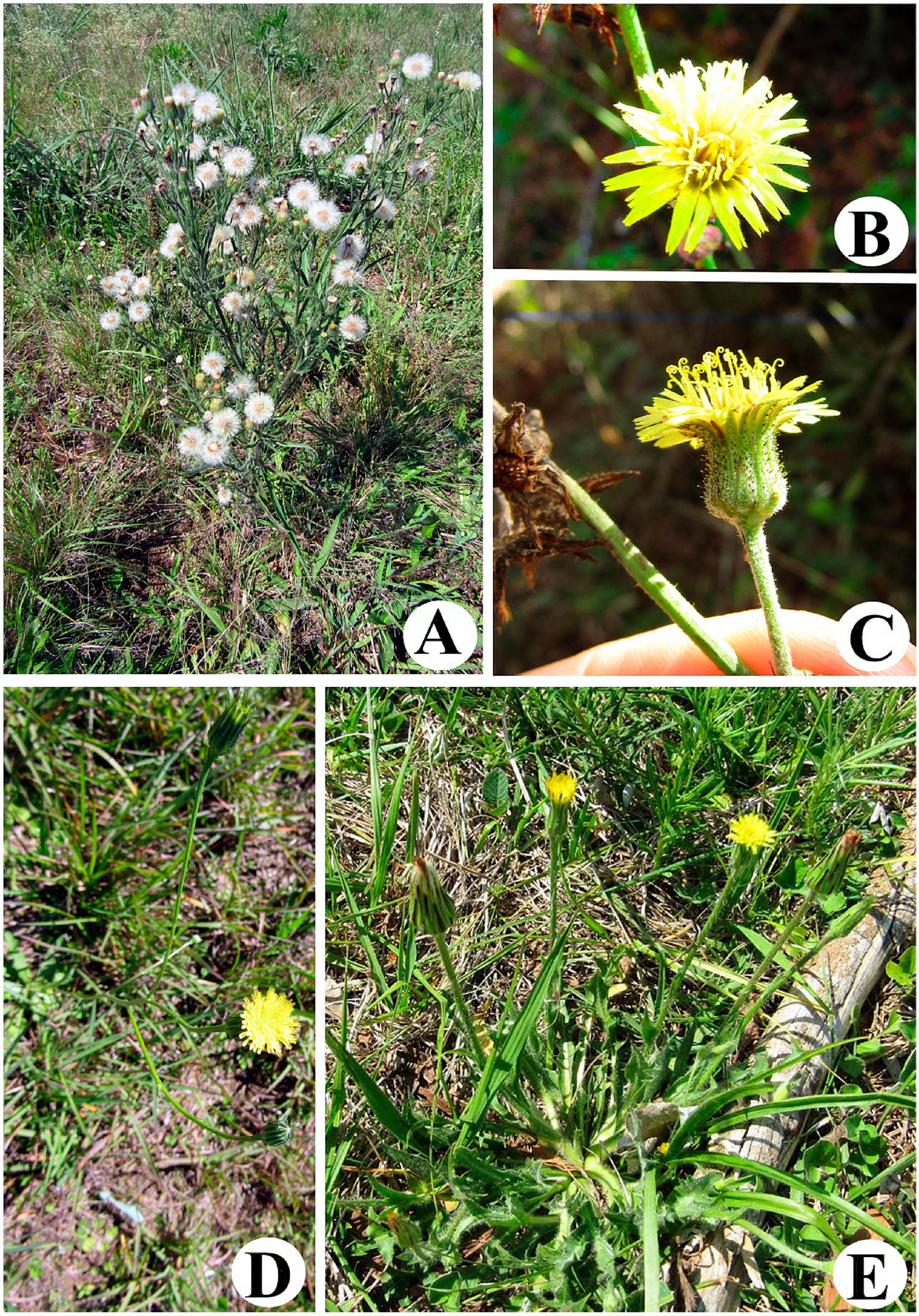

Figure 4. A. *Conyza sumatrensis*. **B, C.** *Hieracium comersonii*. **D.** *Hypochaeris chilensis*. **E.** *Hypochaeris megapotamica*.

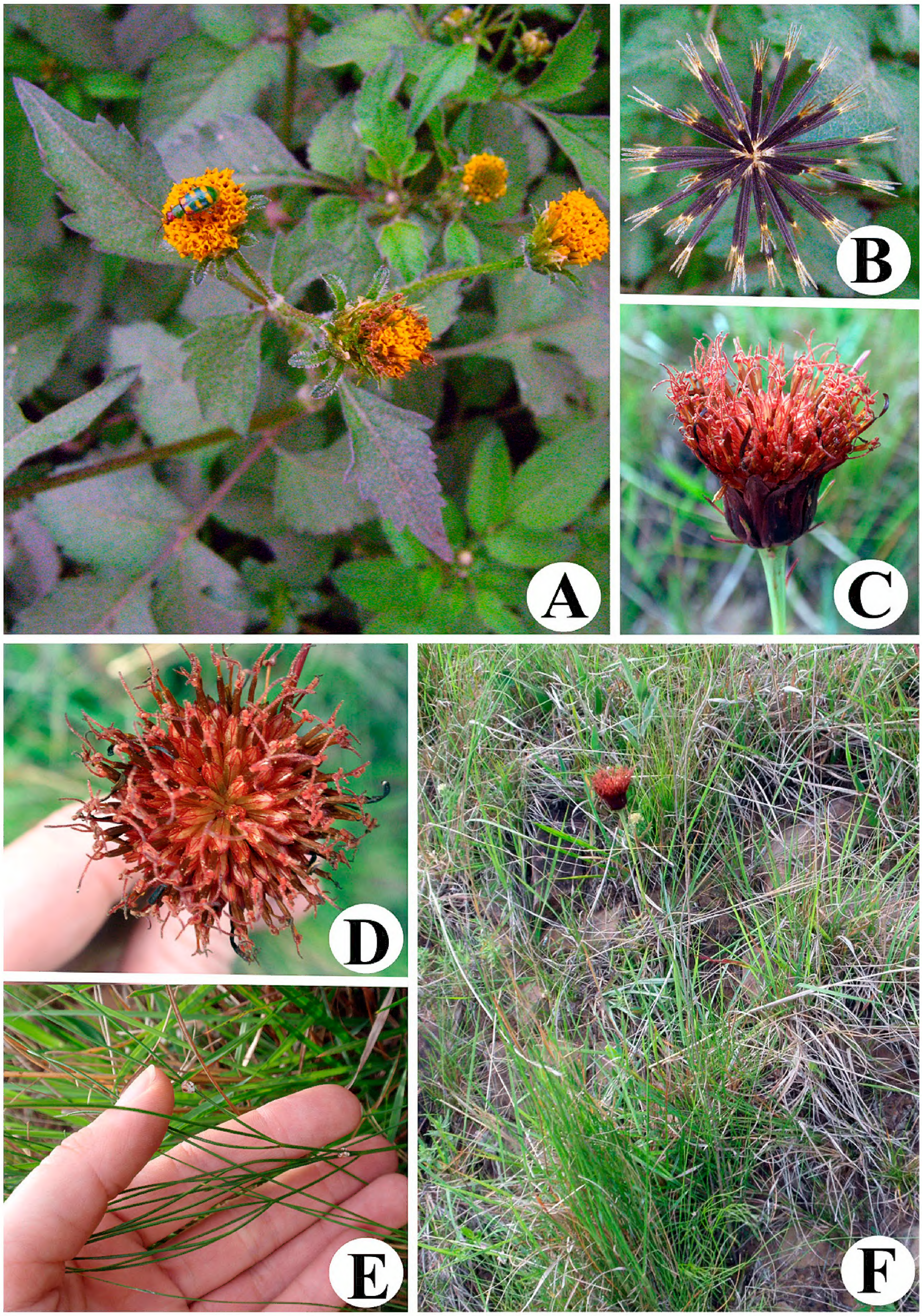

Figure 5. A, B. *Bidens pilosa*. **C, F.** *Isostigma peucedanifolium*.

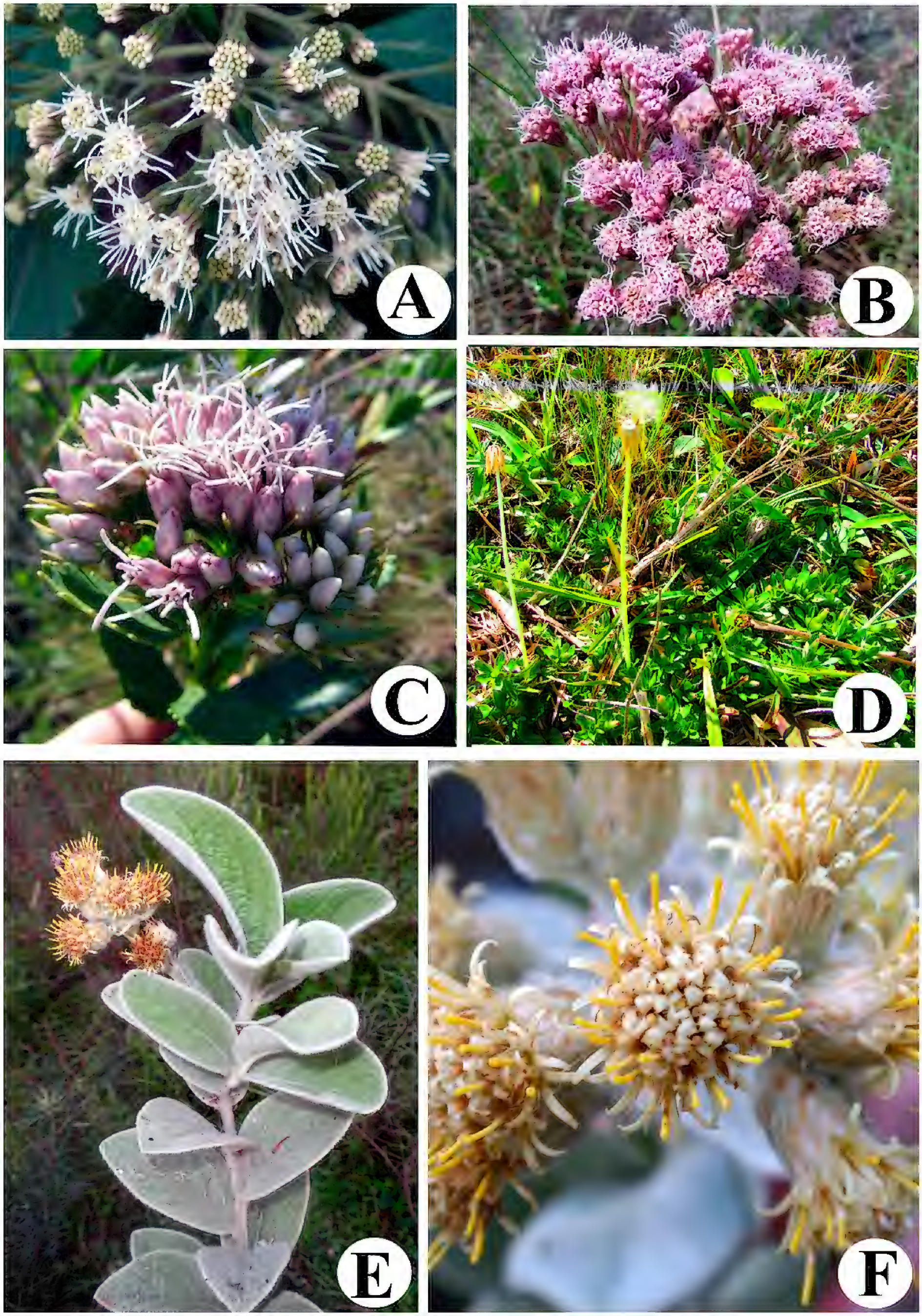

Figure 6. **A.** *Kaunia rufescens*. **B.** *Gyptis tanacetifolia*. **C.** *Symphyopappus cuneatus*. **D.** *Facelis retusa*. **E**, **F.** *Moquiniatrum molissimum*.

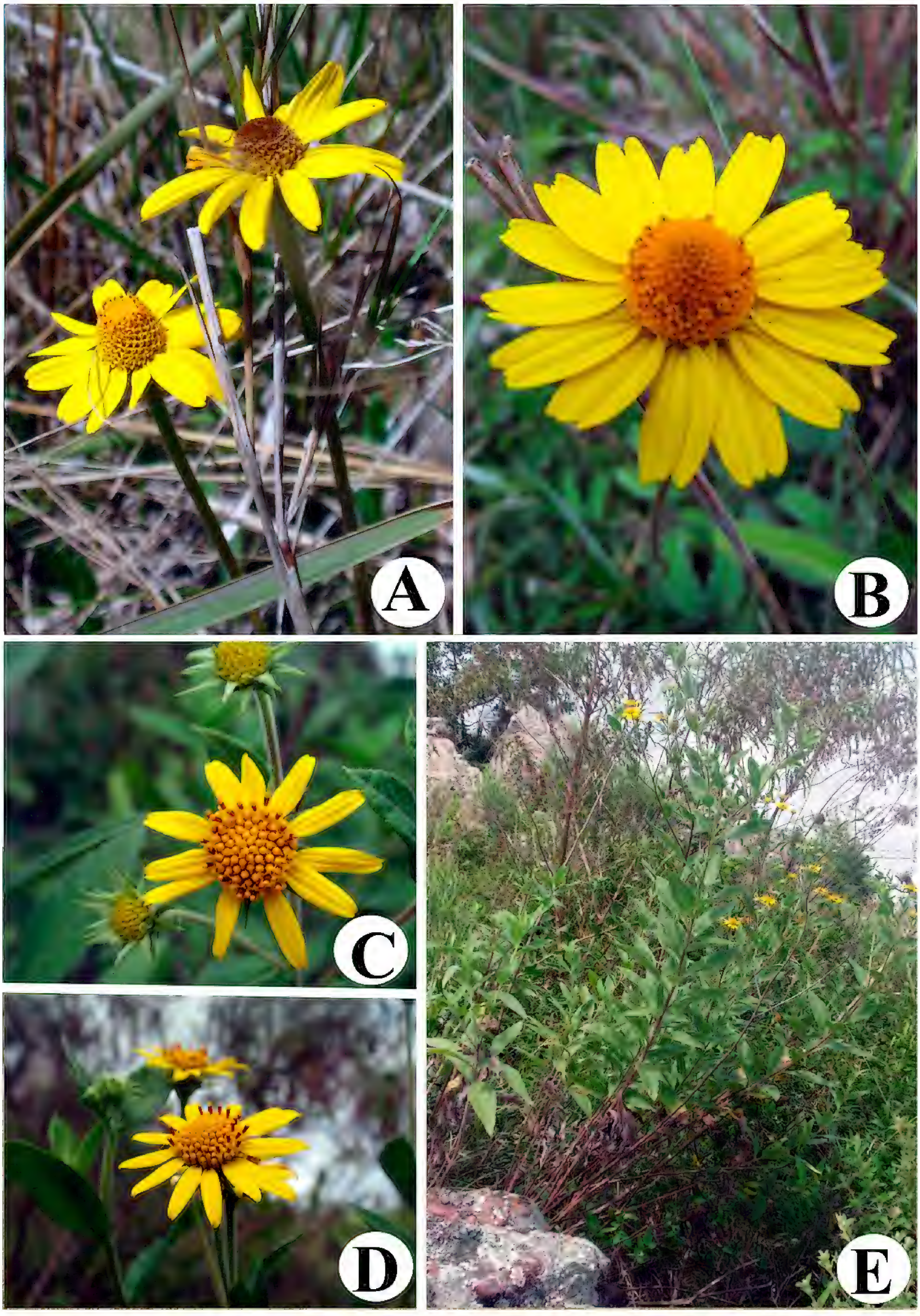

Figure 7. A. *Acmella bellidioides.* **B.** *Aspilia montevidensis.* **C, E.** *Aldama anchusaefolia.*

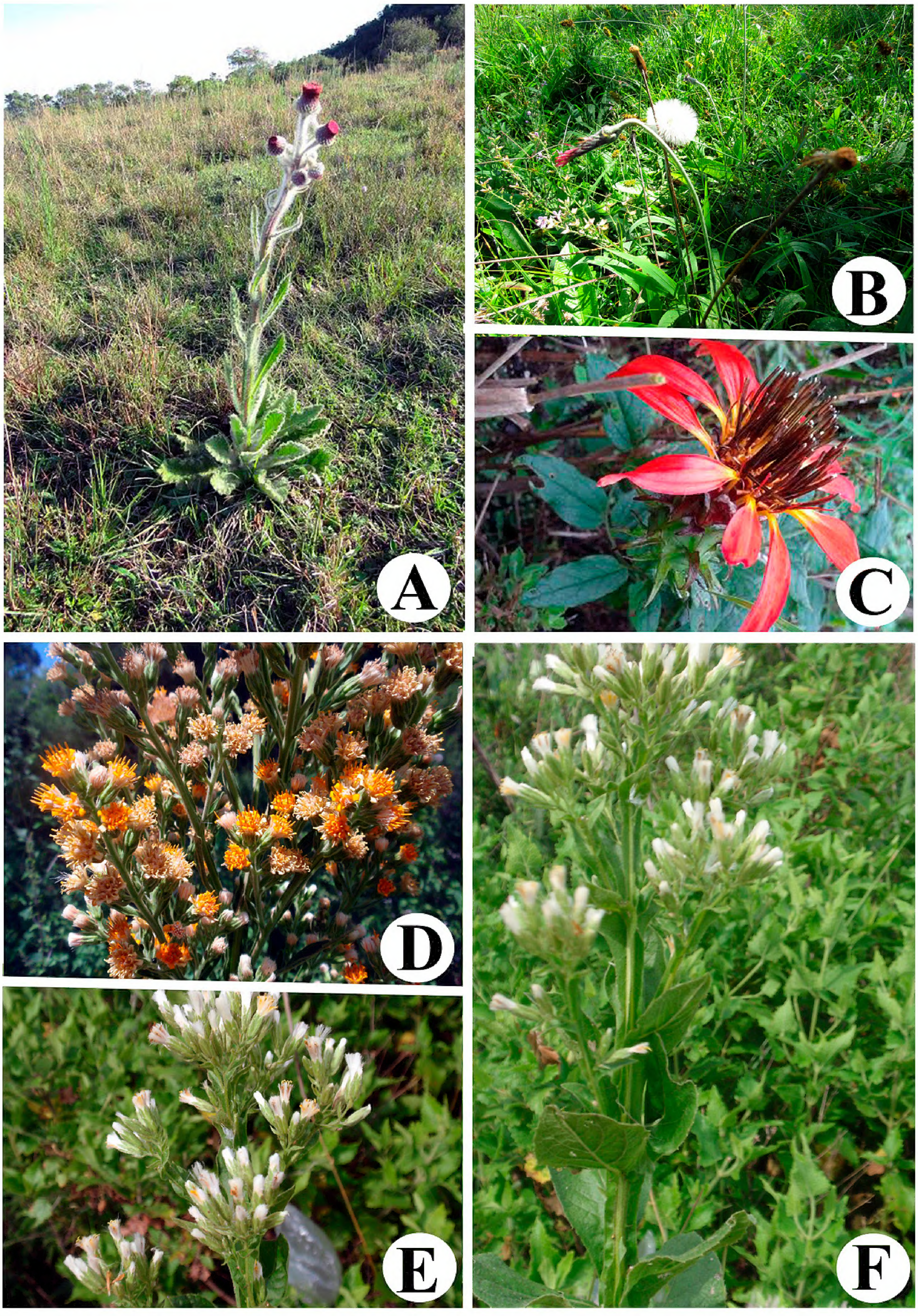

Figure 8. A. *Stenachaenium riedelli*. **B**. *Chaptalia nutans*. **C.** *Mutisia campanulata*. **D.** *Trixis nobilis*. **E**, **F.** *Trixis pallida*.

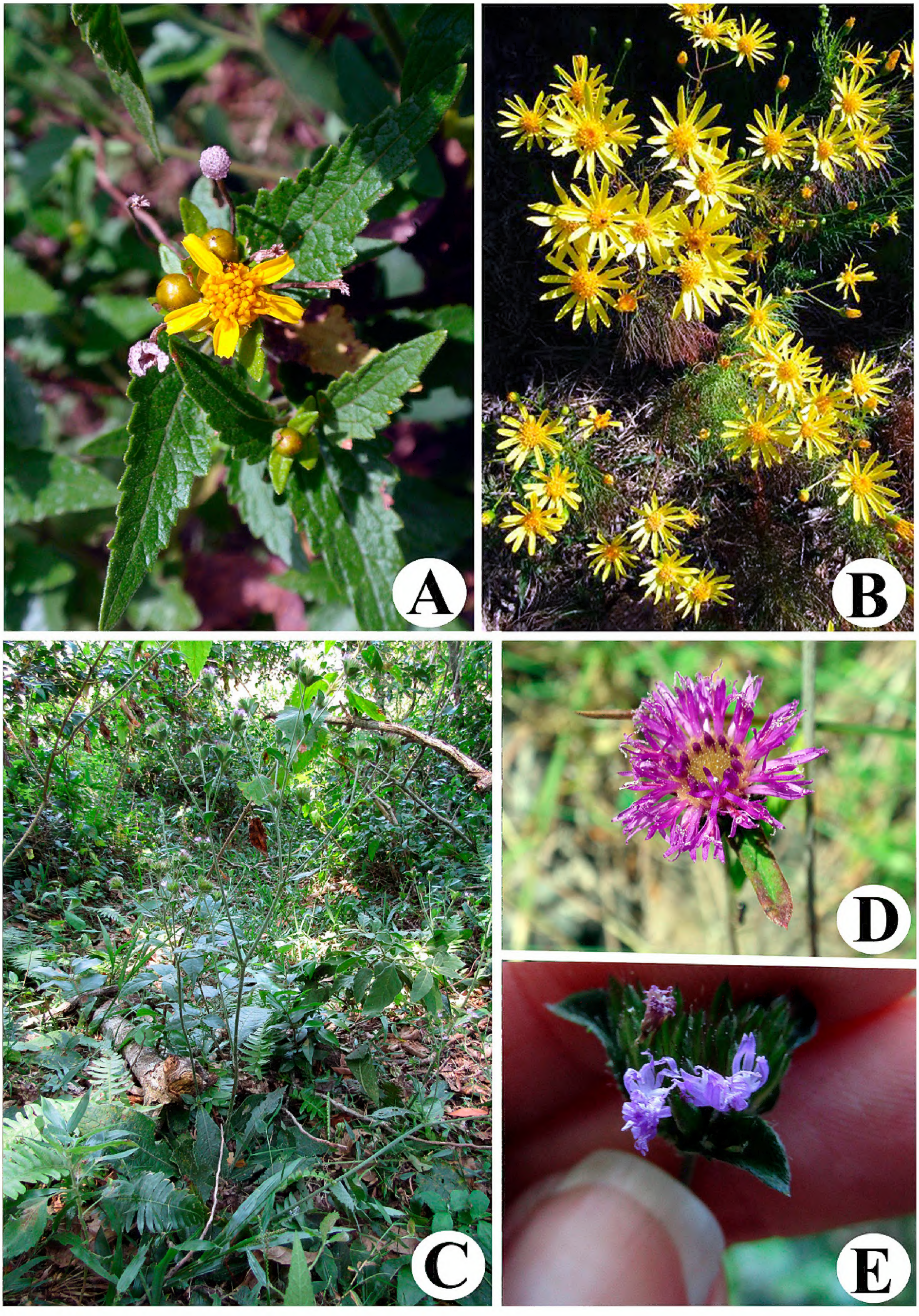

Figure 9. A. *Calea clematidea*. **B.** *Senecio leptolobus*. **C, E**. *Elephantopus mollis*. **D.** *Lessingianthus hypochaeris*.

dense populations and blooming continuously. On the other hand, *Aldama megapotamica*, endemic to the state, has a restricted distribution to the physiographic regions of Central Depression and Eastern Plateau (Mondin 2004). *Isostigma peucedanifolium*, *Trixis pallida*, and *Chromolaena angusticeps* were found only as scattered individuals. *Achyrocline anabelae* was found restricted to the top of the hill, which could be considered as an "inselberg", due to its rocky elevation that emerges between the forest remnant and the rural environment. According to Porembski (2007), rocky outcrops form arid environments that develops centers of diversity for certain types of plants, and often act as spatial refuges for different floras (Clarke 2002), a factor that could explain the relatively high number of endemic and/or threatened taxa found in the study region.

Heterocondylus decipiens, according to Matzenbacher (1979), is a species with a few occurrences in the state, usually limited to the northeastern part. However, this species may be under-collected, due to its morphological resemblance to *Campuloclinium macrocephalum*.

Taxa such as *Conyza*, *Gamochaeta*, *Tagetes, Porophyllum*, *Bidens pilosa*, *Praxelis clematidea*, *Baccharis anomala*, *B. dracunculifolia*, *B. spicata, B. punctulata*, and *Solidago chilensis* were collected mainly in environments where human influence is intense, such as borders of fields and surrounding small farms. In this context, it is noteworthy that the study area is located next to some *Pinus* L. plantations (Fig. 2A), a typical suppression of grasslands currently occurring in the state. According to Ziller and Zalba (2008), the expansion of exotic tree cultures is a drastic change in landscape structure and ecological processes, as it generates a significant source of propagules which often results in the establishment of invasive populations in natural remnants. Thus, the risk of losing locally adapted and the species and the native vegetation progressively advances, by the decrease in the size of natural populations.

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Authors' Contribution

Both authors contributed to all research activities since the conception of the project, including field work and writing. The first author was the main responsible for the herbaria revision, species identifications and analyzing the data, while the second author supervised the work.

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